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ABSTRACT

The first two-thirds of the document is a bibliography on women in the labor market which is divided into 27 categories and sub-categories, the major headings of which are: historical perspective, the supply of female labor in the labor market, earnings of women workers, occupations of women workers (covers occupational distribution, academic and non-academic professional occupations, clerical occupations, blue collar occupations, and service occupations), unemployment among women, women and unionism, attitudes of and toward women working, working women and the rule of law, home production and child care, edited collections of studies on the role of women, bibliographies and review articles, and miscellaneous. The remainder of the document reviews both the theoretical and the empirical literature on sex differentiation in the labor market and focuses on economic research on female/male differences in earnings and occupational assignment. The literature review determined that the sole consistent result of the empirical studies surveyed is that sex discrimination in the form of unequal pay for equal work is of little, if any, quantitative significance. A concluding table summarizes the empirical literature reviewed with respect to data sources and population studied, measure of earnings, statistical method, and explanatory variables and earnings ratio. (JR)

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WOMEN AND THE ECONOMY:

A Bibliography and A Review of the Literature on Sex Differentiation in the Labor Market

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WOMEN AND THE ECONOMY

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FOREWORD

The production of this bibliography and literature review had two principal stimuli. The first was what a colleague and I erroneously thought was a reasonably careful search of the literature in connection with our empirical research on sex discrimination in the labor market. The second was my collaboration with Dr. Hilda Kahne in the preparation of a survey article on women in the economy for the Journal of Economic Literature. Because the scopes of those works precluded both a comprehensive bibliography and a lengthy review of a portion of the literature, I decided to make them available through this medium.

In an attempt to make the bibliography more useful and usable than a simple alphabetical listing, the citations are organized according to a topical outline containing 27 categories and sub-categories. The outline is presented in the Table of Contents which follows this Foreword. For obvious reasons, not the least of which is the arbitrariness of most taxonomic schemes, many of the 500 studies are cited more than once in the bibliography. The typical lag between completion of writing and final publication restrains us from claiming that no relevant research has been overlooked. Indeed, the final category of citations contains items which came to light too late to be included in their appropriate place(s) in previous categories. Nevertheless, within the self-imposed constraints described below we believe this to be the most comprehensive enumeration of literature in this area currently available. The burgeoning interest in women's economic roles and the concomitant proliferation of research by social scientists, however, will doubtless make this claim somewhat shallow within a brief time after the publication sees the light of day. Hopefully, this will continue to serve as a base upon which a constantly current bibliography will be built.

At this point several technical comments about the bibliography are in order. First, several items are cited which were not published at the time we compiled the list. Whenever possible we have included in the citation an institutional affiliation for the author to enable readers to write for copies of the research. Second, many of the items located are available principally in microfiche form. In these instances a source (ERIC = Educational Resources Information Center, P.O. Box 190, Arlington, Virginia, 22210 or NTIS = National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22151) and an identification number are included in the citation. Finally, while we have attempted to make the bibliography comprehensive of research relevant to women's economic roles, some bodies of literature have been omitted which are clearly related. Among these are research dealing with sex differentiation and discrimination in schooling and research on sex differences in occupational/vocational choice. The principal justifications

for these omissions are that their inclusion would have more than doubled the size of the bibliography and would have substantially delayed the production of the report. For similar reasons, items of a purely descriptive nature (e.g., many of the pamphlets regularly produced by the Women's Bureau of the U.S. Department of Labor) have been omitted from the bibliography.

Finally, some grateful acknowledgments are in order. The contributions by Sue Breinich and Pat Shields were so substantial that crediting their collaboration on the title page seems inadequate. Aided by an outstanding computerized literature search service at The Ohio State University Library, they were responsible for scouring the stacks, locating obscure and partial references, verifying the detail of citations, abstracting some of the literature, proofreading and generally riding herd on the bibliography. While absolving them of any responsibilty for the final product, I wish to thank my colleagues Francine Blau, Carol Jusenius, Herbert S. Parnes, and Steve Sandell for their helpful comments on earlier versions of the literature review. Finally, Kandy Bell and Dortha Gilbert expertly typed the several drafts of the report, with more good humor than should be expected for such a tedious task.

Andrew I. Kohen
March 1975

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Sex Differentiation in the Labor Market:
A Review of the Literature

Introduction

There are several dimensions along which male and female labor market experience is (at least superficially) demonstrably different. Beyond earnings and occupational assignment, there are differentials in the incidence of unemployment,[1] in the likelihood of part-time employment,[2] and in the receipt of formal vocational training.[3] However, this review is not comprehensive of all of these dimensions, largely because the body of literature is proliferating so rapidly. Therefore, this survey focuses exclusively on economists' research on female/male differences in earnings and occupational assignment.[4]

Theoretical Work

There are two, not necessarily competing, perspectives from which economists (try to) understand and explain sex differences in earnings and occupation. First, there is a heterogeneous set of writings which may be identified as theories of discrimination. Second, there is the perspective of human capital theory from which some economists view these sex differences as compatible with individual (and family) decision making about investment in human capital and the division of labor in the household.

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[1] See the Bibliography above, p. 38.

[2] See the Bibliography above, pp. 3-10.

[3] See, for example, the section of the Bibliography entitled "Women in Blue Collar Occupations," pp. 37-38.

[4] There are several studies by noneconomists of earnings and occupation differences which are cited in the Bibliography, pp. 10-19. See, for example, Converse and Converse (1971); Haug (1973); LaSorte (1971); Levitin, Quinn and Slaines (1971); and Suter (1973).

In the context of the theories of discrimination, many contemporary economists have begun with the neoclassical model developed by Gary Becker[5] principally to explain racial discrimination. The model is based on fundamental microeconomic principles of utility maximization in the context of a perfectly competitive economy. Earnings, hiring and promotion differences between men and women are seen to derive from "tastes for discrimination"--i.e., preferences to minimize (or avoid) certain economic transactions with women--by men. More specifically, this approach to discrimination focuses on wage differentials between men and women which derive from invidious discrimination by the former in their roles as employers, employees and consumers. Becker's work further employs the microeconomic tools of trade theory to demonstrate who gains and who loses when discrimination occurs.

In response to some perceived deficiences in Becker's analysis-e.g., the general equilibrium aspects of discrimination--Arrow[6] has developed extensions of the theoretical framework in a neoclassical vein. A principal extension is to include additional (information) costs' faced by the employer who does not discriminate. In a similar fashion, Phelps[7] has independently developed a so-called statistical theory of sexual discrimination in the labor market. In essence, this theory is built on the assumption that employers who are attempting to maximize expected profits take sex of a job applicant to represent (inferior) characteristics of the applicant which are not directly measured because of the high cost of direct measurement. Phelps demonstrated that irrespective of the validity of using sex as this type of proxy variable, discrimination is the outcome. Although this theoretical approach to discrimination finds rigorous formulation in the work by Arrow and Phelps, the neoclassical conceptualization also appears in the work of others, albeit with variations in assumptions.[8] In acknowledgment of the validity of this

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[5]Gary S. Becker, The Economics of Discrimination (Chicago: University of Chicago Press, second edition 1971).

[6]Kenneth Arrow, "Models of Job Discrimination," in Anthony Pascal (ed.), Racial Discrimination in Economic Life (Lexington, Mass.: D.C. Heath and Co., 1972).

[7]Edmund Phelps, "The Statistical Theory of Racism and Sexism," American Economic Review 62 (September 1972):659-661.

[8]See, for example, Dwight P. Flanders and Peggy E. Anderson, "Sex Discrimination in Employment: Theory and Practice," Industrial and Labor Relations Review 26 (April 1973):938-955; Nancy M. Gordon and Thomas E. Morton, "A Low Mobility Model of Wage Discrimination--with Special Reference to Sex Differentials," Journal of Economic Theory 7 (March 1974): 241-253; Janice F. Madden, The Economics of Sex Discrimination (Lexington, Mass.: D.C. Health and Co., 1973); Richard Mancke, "Lower Pay for Women:

theory as an explanation for some existing sex differentials in earnings, there has been at least one major judicial decision specifically banning this behavior by employers[9] and at least one study by psychologists attesting to its existence.[10]

Another theoretical approach to sex discrimination in the labor market which recently has been gaining adherents is associated with the revival by Bergmann[11] of the "crowding hypothesis," originally profered by Edgeworth[12] some 50 years ago. This approach retains much of the neoclassical framework and does not preclude the existence of pure wage discrimination--i.e., unequal pay for equal work. Its major distinguishing feature is that it abandons the concept of a perfectly competitive labor market and introduces the idea of discrimination by exclusion--i.e., unequal access to some types of jobs. Basically, the hypothesis is that women are crowded into a small number of occupations by the power and preferences of men. This crowding generates a situation of excess supply to those occupations, depressing the marginal productivity of women (and men) in those segments of the labor market. Thus, even when men and women are paid the value of their marginal products sex differentials arise and persist. Clearly, this approach to sex differentials is quite compatible with the recently reawakened interest of economists in balkanized (or "dual") labor markets as illustrated in the work by Bluestone et al. and

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A Case of Economic Discrimination," Industrial Relations 10 (October 1971): 316-326; Paul A. Samuelson, "Economics of Sex: A Discussion," in Economic Problems of Women--Hearings before the Joint Economic Committee, U.S. Congress (July 1973):61-64.

[9]The case was Wirtz v. Midwest Manufacturing Corporation as cited in John Burns and Catharine Burns, "Analysis of the Equal Pay Act," Labor Law Journal 24 (February 1973):92-99.

[10]Earl Cecil, Robert Paul and Robert Olins, "Perceived Importance of Selected Variables Used to Evaluate Male and Female Job Applicants," Personnel Psychology 26 (1973):397-404.

[11]Barbara Bergmann, "Occupational Segregation, Wages and Profits When Employers Discriminate by Race or Sex," mimeo (University of Maryland, 1971).

[12]F. Y. Edgeworth, "Equal Pay to Men and Women for Equal Work," Economic Journal 32 (December 1922):431-457.

Doeringer and Piore.[13] Blau's research[14] has extended the development of the crowding or segmentation hypothesis to suggest that intra-occupational segregation by establishment (as well as inter-occupational segregation in the market at large) can account for male/female earnings differences.

Another departure from the neoclassical competitive model of sex discrimination in the labor market can be found in Madden's book,[15] where she described a conceptual framework relying on market imperfections as an alternative mode of explaining the existence of sex discrimination. While she considered both the traditional paradigm of monopsony and the implications of assuming the existence of male-employee monopoly power over labor supply, the analysis was developed with far less detail and rigor than the competitive model. In a spirit similar to Madden's, Gordon and Morton[16] have developed a model of wage discrimination which emphasizes both market imperfections (i.e., monopsony) and discriminatory "tastes" of fellow employees to explain sex differentials in earnings. Finally, what has recently come to be known as "radical" economics seems to incorporate the neoclassical assumption of profit maximization and Marxian assumptions of monopoly capitalism and class interests to explain discrimination in the form of segmented labor markets.[17]

Human capital theory is the second theoretical perspective which has increasingly been brought to bear on observed male/female differences in labor market earnings. In the extreme, this approach seems to be formulated to demonstrate that observed sex differences are the result of differences in productivity between males and females, of sex differentiation in socialization which occurs prior to labor market entrance, and/or of sex differentiation in the household division of

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[13]Barry Bluestone, William Murphy and Mary Stevenson, Low Wages and the Working Poor (Ann Arbor: Institute of Labor and Industrial Relations, 1973); Peter Doeringer and Michael J. Piore, Internal Labor Markets and Manpower Analysis (Lexington, Mass.: D.C. Heath and Co., 1971).

[14]Francine D. Blau, "Sex Segregation of Workers by Enterprise," mimeo (Trinity College, 1973), and "Pay Differentials and Differences in the Distribution of Employment of Male and Female Office Workers," Ph.D. dissertation, Harvard University, 1975.

[15]Madden, Sex Discrimination.

[16]Gordon and Morton, "Low Mobility Model."

[17]This is suggested in Ray Marshall, "The Economics of Racial Discrimination: A Survey," Journal of Economic Literature 12 (September 1974):849-871.

labor. The essence of the theoretical argument is that women have different expectations from males about labor force participation over a lifetime and, therefore, women make different decisions from men about investment in their own human capital, both during and after formal schooling.[18] This type of differential in human capital investment also has been utilized to indicate why differences in the earnings of single and married women exist and persist.[19]

Sandell's work[20] with a human capital model went somewhat beyond incorporation of discontinuous labor force participation by including an explicit measure of one type of labor market discrimination--i.e., different rates of return to investment in human capital. Further, he examined the theoretical implications of changes in this type of discrimination on investment behavior and its interaction with labor force participation. Finally, Gronau[21] has developed a model emanating from the human capital approach to job search behavior which suggests that a so-called selectivity bias in measuring the wage-offer distribution of women leads to underestimation of the "true" gross male/female earnings gap. That is, disproportionately fewer women in the lower part of the wage-offer distribution are likely to be observed in the labor market. In other words, there is even more to explain than is commonly observed.[22]

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[18]See, for example, Jacob Mincer and Solomon Polachek, "Family Investments in Human Capital: Earnings of Women," Journal of Political Economy 82 (March/April 1974):S76-S108; and Solomon Polachek, "Discontinuous Labor Force Participation and Its Effects on Women's Market Earnings," in Cynthia Lloyd, (ed.), Sex Discrimination and the Division of Labor (New York: Columbia University Press, forthcoming).

[19]See, for example, James Gwartney and Richard Stroup, "Measurement of Employment Discrimination According to Sex," Southern Economic Journal 39 (April 1973):575-587; and Solomon Polachek, "Differences in Expected Post-School Investment as a Determinant of Market Wage Differentials," mimeo (University of North Carolina, n.d.).

[20]Steven Sandell, "Male-Female Salary Differences Among Scientists with Ph.D.'s," Ph.D. dissertation, University of Minnesota, 1973.

[21]Reuben Gronau, "The Wage Rates of Women--A Selectivity Bias," mimeo (NBER, 1972) and "Wage Comparisons-A Selectivity Bias," Journal of Political Economy 82 (November/December 1974):1119-1143.

[22]However, see also H. Gregg Lewis, "Comments on Selectivity Biases in Wage Comparisons," Journal of Political Economy 82 (November/December 1974):1145-1155.

Although many of the above-mentioned studies allude to occupational segregation according to sex, there is only a limited literature in economics dealing with the causes of this phenomenon. The theoretical work which holds that sex differences in earnings can be explained by differences in expected lifetime labor force participation also suggests that the latter can account for the observed sex segregation of occupations.[23] That is, occupations vary with respect to the continuity of activity required for acceptable performance and with respect to the amount of formal training necessary for entrance. This variation, in conjunction with sex differences in types and amounts of occupational training and in expected continuity of employment, leads to considerable difference in the occupational distributions of males and females. However, direct sex discrimination by consumers, male employees and the various "gatekeepers" of some occupations has also been alleged to be the source of at least some of the observable segregation.[24]

Despite the recent proliferation of theoretical papers, economists are still some distance from having a comprehensive theory capable of explaining observed earnings differentials between males and females. It is quite beyond the scope of this review to attempt a synthesis of the several theoretical tacks being pursued. One may hope, however, that pursuit of several lines of thought, along with serious consideration of the role of various economic and social institutions ala Ray Marshall's recent article[25] will eventuate a synthesis.

Empirical Work

Although there is as yet no comprehensive theory of sex differentials in labor market experience, the various conceptual frameworks have

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[23]See, for example, George Johnson and Frank Stafford," The Earnings and Promotion of Women Faculty," American Economic Review 64 (December 1974):888-903; Polachek, "Differences in Expected Post-School Investment"; and Sandell, "Male-Female Salary Differences."

[24]See, for example, Bergmann, "Occupational Segregation"; Victor Fuchs, "Differences in Hourly Earnings Between Men and Women," Monthly Labor Review 94 (May 1971):9-15; Burton Malkiel and Judith Malkiel, "Male-Female Pay Differentials in Professional Employment," American Economic Review 63 (September 1973):693-704; Isabel Sawhill, "The Economics of Discrimination Against Women: Some New Findings," Journal of Human Resources 8 (Summer 1973):383-396; Harriet Zellner, "Discrimination Against Women, Occupational Segregation, and the Relative Wage," American Economic Review 62 (May 1972):157-160.

[25]Marshall, "Racial Discrimination."

generated empirically testable hypotheses. The empirical studies surveyed below have the common characteristic of trying to explain an observed sex differential in labor market earnings by allocating the gross male/female difference among its various causes. The underlying motivation often is to determine the quantitative importance of labor market discrimination as a cause of the observed difference.

Since economists rarely employ the research tools of microeconomic experiments or case studies, the empirical assessment of the importance of labor market discrimination as a source of sex differentials relies on the identification of discrimination as the "residual," after other sources of the differential have been "held constant." In other words, since discriminatory behavior is never directly observed, its existence must be inferred by (statistically) eliminating the other sources of sex differences in earnings and observing that differential which remains unexplained. Unfortunately, it is this inferential process that is the basis for much legitimate debate about any given set of statistical results or about any comparison of two (or more) sets of results. That is, there is no consensus among researchers on what constitute the "other" (legitimate) sources of a male/female disparity in earnings and on how they should be measured. For example a principal source of debate is whether sex differences in occupational distribution are to be considered the outcome of labor market discrimination or of discrimination in the home and schools prior to labor market entrance.

Furthermore, several statistical methods have been employed to "hold constant" factors other than discrimination in computing the residual, and these may produce conflicting conclusions even with a common data set. Some research[26] has utilized the technique of standardization of frequency distributions. Beginning with the mean earnings of men and women, it is clear that each is the weighted average of, say, mean earnings within educational groups, where the weights are the numbers of people in each educational group. By assigning to men (women) the educational distribution of women (men), it is possible to construct a new weighted average which can be thought of as the mean earnings of men (women) if both groups had the same amount of schooling. Successive (or simultaneous) standardization for other characteristics which both affect earnings and differ as between men and women can lead to a prediction of what male (female) average earnings would be in the absence of anything but discrimination by sex in the labor market. As is also true of other methodologies, this approach to estimating the effect of discrimination involves the familiar index number problem--i.e., it is not clear a priori which set of weights is the correct one to use in standardizing. Furthermore, since standardization by a particular characteristic removes the effect of that characteristic,

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[26]See, for example, Gwartney and Stroup, "Employment Discrimination"; and Robert Tsuchigane and Norton Dodge, Economic Discrimination Against Women in the United States (Lexington, Mass.: D.C. Heath and Co., 1974).

the "standardized" difference between men and women may understate the impact of discrimination--i.e., insofar as sex differences in the particular characteristic are the result of discrimination.[27]

A second statistical technique for estimating the impact of discrimination has been to employ regression analysis to control for factors other than sex in the determination of earnings. In its simplest form this involves regressing earnings on a host of variables including a dichotomous variable representing sex. The resulting regression coefficient of the dummy variable has then been taken to represent the magnitude of the differential in earnings that would prevail in the absence of sex differences in other earnings-determining characteristics.[28] That is to say, the coefficient (t-ratio) measures the impact (significance) of discrimination. However, as can be demonstrated, this approach will mis-estimate the impact of discrimination if there are differing earnings structures for males and females. In the language of the econometrician, the mis-estimates are generated by specification bias resulting from unmeasured interactions.

One response to this problem that appears in some recent empirical research is to employ both regression and standardization techniques to measure the effect of discrimination.[29] That is, separate earnings regressions are calculated for males and females and the resulting coefficients are used as the weights in computing predicted mean earnings which would prevail in the absence of different earnings structures (or different mean values of the regressor variables). Using this technique also permits the researcher to identify which elements in the earning structure may themselves be manifesting the effects of discrimination--e.g., different rates of return to investments in schooling or OJT. As noted above, this procedure also involves an index number problem of selecting

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[27]For example, women may desist from pursuing post-baccalaureate study because they perceive a high likelihood of encountering discrimination in those jobs for which the schooling would ostensibly prepare them.

[28]This approach is used, for example, in Malcolm Cohen, "Sex Differences in Compensation," Journal of Human Resources 6 (Fall 1971):434-447; and H. Arnold Tolles and Emanuel Melichar, "Studies of the Structure of Economists' Salaries and Income," American Economic Review 58 (December 1968):Part 2.

[29]See, for example, Alan Blinder, "Wage Discrimination: Reduced Form and Structural Estimates," Journal of Human Resources 8 (Fall 1973):436-455; and Ronald Oaxaca, "Male-Female Wage Differentials in Urban Labor Markets," International Economic Review 14 (October 1973):693-709.

the "proper" regression weights. In some studies both sets of weights are used to provide a range of possible values.

Another approach to the specification problem is to fit earnings regressions which contain explicit interaction terms (i.e., variables which are the product of multiplying the dichotomous variable representing sex by other variables in the model). If the set of interaction terms is exhaustive (i.e., each regressor enters the equation as does the product of each regressor with the sex variable), the resulting coefficients will be identical to what would be generated by performing separate regressions for males and females. However, if the set is not exhaustive, there may be reason to question whether the estimated impact of discrimination is not still marred by misspecification bias.

Finally, some research has acknowledged that single equation models of earnings determination may be inadequate in addressing questions of sex differences in earnings. One form of this acknowledgment has been to apply the tools of 2-stage-least-squares analysis to simultaneous equation systems depicting earnings and labor supply determination.[30] Another has been to generate estimates of discrimination's impact for reduced form and structural equations--e.g., where the latter includes controls for industrial and occupational affiliation but the former does not.[31] This is one method of identifying the form in which sex discrimination is manifested. Still another approach to this question has been to decompose the male/female earnings differential sequentially.[32] For example, using the regression and standardization techniques described above it is possible to predict the educational attainment of men (women) in the absence of sex differentiation in schooling. This predicted value then can be used in the regression standardization of post-school earnings. With appropriate modeling this sequential decomposition could be expanded several-fold to include post-school investment in training, occupational assignment, etc. Under certain assumptions (e.g., recursiveness) about the structure of such multiple equation models, it is also possible to examine so-called indirect and direct effects of various sources of sex differences in earnings.

This review of empirical findings begins with studies based on national samples of the entire labor force in order to emphasize research whose conclusions are (more or less) applicable to the entire economy. Following

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[30] Mincer and Polachek, "Family Investments."

[31] See, for example, Blinder, "Wage Discrimination"; and Oaxaca, "Male-Female Wage Differentials."

[32] Andrew I. Kohen and Roger D. Roderick. "The Effects of Race and Sex Discrimination on Early Labor Market Achievement," mimeo (Columbus: The Ohio State University, 1973).

this, attention is directed to studies of more restricted groups such as academics, nonacademic professionals, and selected age-groups of workers. As a final prefatory comment it is worth noting that a wide variety of statistics has been used to represent the sex differential in earnings. In order to provide comparable numbers throughout this review, the researcher's figures have been converted, where possible, to the simple ratio of the (arithmetic) mean female earnings to the (arithmetic) mean male earnings. In addition, an average of the alternative estimates provided by the researcher is often presented here--e.g., when the researcher calculated one adjusted ratio by standardizing with the male weights and another by standardizing with the female weights.

Several economists have employed data from decennial Censuses to analyze the sex differential in earnings. Sanborn[33] used 1950 data for employed wage and salary workers to adjust the female/male ratio of annual earnings from .58 to .75, by standardizing for differences in annual hours of work, years of schooling, race, urban/rural residence, occupational distribution, and age. On the basis of special Bureau of Labor Statistics (BLS) studies of productivity and piece-rate wages in selected firms of two industries he further suggested that some of the remaining differential may derive from sex differences in productivity. On the other hand, his estimates of the maximum possible earnings differential attributable to real sex differences in turnover rates and absenteeism are miniscule. Nevertheless, Sanborn's application of the results of these and other BLS special studies led him to arrive at a final adjusted earnings ratio of .88. Because of the substantial effect of standardizing for 262 detailed occupations, he concluded that the principal manifest form of discrimination is occupational segregation.

Fuchs' oft-cited analysis[34] of 1960 Census data led to conclusions analogous to Sanborn's. Focusing on nonfarm workers and controlling for race, education, age, city size, marital status and class of worker, Fuchs used regression analysis to adjust a female/male ratio in hourly earnings from .60 to .66. After examining some crude data on sex differences in labor force participation and turnover along with industrial variation in the sex difference in wages, he concluded that the principal explanation for the lower wages of females is role differentiation which affects occupational choice, labor force attachment, post-school investment, etc. He further concluded that sufficiently detailed controls for occupation would probably explain almost all of the earnings disparity, but that this would merely recast the problem: differences in occupational distributions would then become the topic of

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[33]Henry Sanborn, "Pay Differences Between Men and Women," Industrial and Labor Relations Review 17 (July 1964):534-550.

[34]Fuchs, "Differences in Hourly Earnings."

research.[35] Finally, Fuchs asserted that his evidence compels rejection of the hypothesis that employers discriminate against women in terms of wages.[36]

Gwartney and Stroup[37] used aggregate data from both the 1960 and 1970 censuses in their attempt to study employment discrimination against women. Relying primarily on frequency distribution standardization techniques they concluded that sex differences in employment preferences were more important than discrimination in causing income differences according to sex. To a large extent this was inferred from their ability to adjust the female/male median income ratio from .98 to .99 among never married persons whereas the adjustment was only from .33 to .51 for persons who were married spouse present. However, this conclusion must be viewed as highly tentative, if only because of the authors' use of income (not earnings) data and the ad hoc standardization procedures. The regression analyses performed were similarly marred by inappropriate data, the failure to consider the possible interactions between sex and the other determinants of earnings, and the failure to acknowledge the differential validity between men and women in using age as a proxy for experience.

Similar conclusions were reported by Cohen[38] from his analysis of data for full-time wage and salary workers aged 22-64 obtained from the University of Michigan's 1969 Survey of Working Conditions. Using regression analysis and some ad hoc standardizations to control for age, education, union membership, length of service with current employer, rate of absenteeism, level of fringe benefits, occupational group (professional versus nonprofessional), and annual hours of work, Cohen

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[35]Some support for the position can be found in the growing interest in the "crowding" hypothesis referred to earlier. For example, see Blau, "Pay Differentials."

[36]The evidence is not nearly so compelling when it is recalled that in "Differentials in Hourly Earnings by Region and City Size, 1959" (NBER Occasional Paper no. 101, 1967) Fuchs himself indicates that reported earnings for self-employed persons may include substantial returns to physical capital as well as to human capital. Also, Fuchs' assertion that self employment is frequently an outlet for groups who encounter significant employer discrimination may not bear close scrutiny. For example, in 1969 among employed male nonfarm workers 16 years of age and older blacks were only 60 percent as likely (5 versus 8 percent) as nonblacks to be self employed. (Calculated from U.S. Bureau of the Census, Census of Population: 1970 Subject Reports, Final Report PC(2)-7A, Occupational Characteristics, Washington: 1973).

[37]Gwartney and Stroup, "Measurement of Employment Discrimination."

[38]Cohen, "Differences in Compensation."

adjusted a female/male annual earnings ratio from .55 to .71. An interesting and unique feature of this study is the analysis of the impact of fringe benefit differences between men and women. The calculation indicated that not only are the fringes received by women not compensatory for their lower earnings, but that holding fringes constant actually widens the earnings gap. Finally, rather than attribute the residual 29 percent gap in earnings to discrimination, Cohen alluded to the following likely causes of it: women are in lower paying occupations, receive less OJT, have healthier working conditions and have preferences which limit the occupations, industries and firms in which they seek employment.

Summarizing her more extensive study using 1967 Current Population Survey data on employed wage and salary workers, Sawhill[39] concluded that it was possible to increase the overall annual earnings ratio from .46 to .56 by controlling for sex differences in race, region of residence, education, age, annual weeks worked and whether the job is full or part time. Additional adjustment for sex differences in age-earnings profiles (an approximation to more accurate measurement of women's OJT provided by actual labor force experience) increased the overall ratio only to .57.[40] Sawhill then concluded that these results are consistent with the hypothesis that discriminatory segregation of women into occupations is at the root of the earnings difference in that it precludes women from receiving training, lowers their aspirations and restricts their job search.

In comparison to the preceding studies, several researchers who utilized data from the 1967 Survey of Economic Opportunity (SEO) have attributed larger proportions of the observed sex differential in earnings to labor market discrimination. In one of the most elaborate studies Oaxaca[41] controlled for a large number of personal and environmental characteristics[42] in order to adjust a female/male hourly wage ratio

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[39] Sawhill, "Discrimination Against Women."

[40] It should be noted that the study reported adjusted ratios as high as .73 among 20-24 year old ever-married whites and as low as .48 among their counterparts 35-44 years of age.

[41] Oaxaca, "Male-Female Wage Differentials," and "Sex Discrimination in Wages," in Orley Ashenfelter and Albert Rees (eds.), Discrimination in Labor Markets (Princeton: Princeton University Press, 1973).

[42] The controls were implemented by performing separate regressions for males and females and using the resultant coefficients to estimate standardized earnings ratios. The characteristics controlled were: potential labor force experience (age-schooling-6), education, health status, marital-family status, whether the job is full or part time, region of residence, migration history and size of area of residence.

from .65 to .72 among urban whites and from .67 to .69 among urban blacks. When he added controls for occupation, industry and class of worker, the adjusted ratios rose to about .78 and .80, respectively. Thus, even if sex segregation by industrial sectors, major occupations groups, and class of worker is considered to be solely the product of role differentiation (e.g., socialization), Oaxaca's findings imply that about three-fifths of the unadjusted wage gap is due to sex discrimination in the labor market. He also concluded that trade unionism is one of the institutions of the labor market through which this discrimination is manifested--i.e., for whites and blacks alike the presence of unions depressed the wages of females relative to males.[43]

In their monograph on poverty[44] Bluestone et al. used the SEO data to estimate a white female/white male hourly wage ratio of .64 and a black female/white male ratio of .50 among full-time full-year[45] workers. The authors' frequency-distribution standardization for education and occupation raised the ratios to .66 and .62, respectively. The residual difference was not attributed to discrimination but rather to schooling quality, industrial affiliation, skill levels, formal training, health and age. In carrying this group's work further in an unpublished paper[46] one of the authors concluded that women occupy jobs below their ability more often than men do, based on a comparison of the female/male wage ratio to a female/male education ratio within occupation groups.[47] Further,

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[43]This same conclusion was reached in a study of unionism and racial discrimination, based on SEO data. See Orley Ashenfelter, "Discrimination and Trade Unions," in Ashenfelter and Rees (eds.), Discrimination in Labor Markets.

[44]Bluestone, Murphy and Stevenson, "Low Wages."

[45]Full-time full-year workers were defined in this study as those working at least 30 hours/week and at least 40 weeks/year. Also, the ratio figures cited above are averages of the various figures reported in the study.

[46]Mary Stevenson, "Womens' Wages: The Cost of Being Female," mimeo (University of Massachusetts, Boston, 1972).

[47]While the interpretation is intuitively plausible, it perhaps should be noted that that statistic underlying it does not yield an unambiguous interpretation. Letting $W_m(W_f)$ and $E_m(E_f)$ represent the wage and education, respectively, of males (females), Stevenson's interpretation is based on finding $\frac{W_m - W_f}{W_m} / \frac{E_m - E_f}{E_m} < 0$. However, it is clear that this condition can prevail if either $\frac{W_m - W_f}{W_m} < 0$ or $\frac{E_m - E_f}{E_m} < 0$ and that the author's interpretation follows only in the latter instance.

she concluded that one-third of the gross differential in wages is attributable to the relative concentration of women in industries of low profitability and market power.

In a study whose methods and conclusions were similar to Oaxaca's, Blinder[48] employed data from the University of Michigan Survey Research Center's Income Dynamics Panel and focused on the sex wage differential among employed heads of household who were 25 years of age and older. Although the sample included whites and blacks, the analysis of the male/female wage gap was performed only for whites. Beginning with an unadjusted ratio of .56, Blinder adjusted this in two ways. The first was by regression standardization with a so-called reduced-form equation whose regressors were age, health, number of siblings, father's education, parental wealth, migration history, and characteristics of both residence during youth and current residence. The second was also by regression standardization with a so-called structural equation which omitted the family background variables of the reduced-form and added variables representing education, occupation, formal vocational training, union membership and length of service with current employer. Adjustment of the gross wage ratio (for whites) by the reduced-form results yielded virtually no change in its value. Adjustment by the structural equation results increased the ratio to about .63. Because Blinder gave less than complete attention to the fact that as they grow older women have increasingly less labor market experience than men, his attribution of two-thirds of the wage gap to labor market discrimination and one-third to discrimination in occupational assignment (and seniority) must be viewed as tentative.

All of the remaining empirical studies of sex differentials in earnings are based on more narrowly defined populations and, while they are interesting, yield conclusions that are not necessarily applicable to the overall labor market. Professionals in academe constitute the most frequently studied population subgroup in this area for two reasons. First, reasonably complete data are relatively more available for the group than for other portions of the population. Second, attention to and consciousness of affirmative action programs has been very high among members of this group. Since there is a relatively large body of literature concerning this group, the next section of this review begins by focusing on it.[49]

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[48] Blinder, "Wage Discrimination."

[49] With the exceptions of two studies that appeared in the American Economic Review the large number of (rather unsophisticated) studies of male/female earnings differences within specific, identified institutions will not be reviewed here. A full enumeration of the published studies appears in the Bibliography in section IV C1, pp. 24-28.

In separate studies using survey data from the National Science Foundation Register Bayer and Astin, Johnson and Stafford, and Sandell[50] have examined the sex differences in annual earnings of professionals in academe. Using 1964 academic salary data for Ph.D.'s in full-time, science teaching positions with 6 or fewer years of experience, Bayer and Astin estimated that the female/male earnings ratio exceeded .92. However, tables controlling for the type of institution (college or university), academic rank (high or low), field of specialization (natural and social science), and amount of post-degree work experience showed a wide range of values of the ratio. Overall, the figure was somewhat lower for a more experienced (five to six years) than for a less experienced (two years) group and lower in the natural than in the social sciences. Despite their small sample sizes, relatively crude tabular analysis and minimal number of statistically significant differences in average salary, the authors nevertheless concluded that the data support a conclusion that there is relatively more sex discrimination in salaries than in promotion and tenure. However, in view of the noted limitations, this conclusion must be viewed as tentative at best.

Using a more elaborate theoretical foundation for their model Johnson and Stafford[51] demonstrated that taking explicit account of (1) the actual (discontinuous) work experience of women academics (in anthropology, biology, economics, mathematics, physics and sociology) and (2) a curvilinear age-earnings relationship eliminated a substantial portion of the observed sex difference in annual earnings. Their regression analysis incorporated controls for pre- and post-Ph.D. professional experience, quality of graduate training and field of specialization.[52] One of the

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[50]Alan E. Bayer and Helen S. Astin, "Sex Differences in Academic Rank and Salary Among Doctorates in Teaching," Journal of Human Resources 3 (Spring 1968):191-200; Johnson and Stafford, "Earnings and Promotion," and "Lifetime Earnings in a Professional Labor Market: Academic Economists," Journal of Political Economy 82 (May/June 1974):549-569; Sandell, "Male-Female Salary Differences."

[51]Johnson and Stafford, "Earnings and Promotion."

[52]Although the authors used Chow tests to test for male/female differences in the salary determination equation, the tests were arbitrarily selective and the final results may still contain errors due to misspecification of the estimating equation. This reservation applies even more forcefully to the extensions of their analysis to (1) a single field of specialization within subsamples of schools and (2) a single school. In both of these analyses interaction variables were omitted which were found to be important in the earlier analysis. Similarly, the entirety of the authors' second article ("Lifetime Earnings. . .") was based on empirical models which excluded interaction terms and, therefore, provides questionable conclusions about the net sex differences in earnings among acadmic economists.

pricipal conclusions was that the discontinuity of work experience among female academics was the major source of the observed sex differential in earnings. For example, while the observed ratio in mathematics (in 1970) was .78, the net ratio at zero years of experience was .94 and at ten years of experience it was .82. Placed in a human capital framework these results imply that women acadmics receive a lower rate of return on their investment in OJT than do their male counterparts. While this could be interpreted as a manifestation of discrimination, Johnson and Stafford interpreted it as the outcome of cultural factors which prescribe the household division of labor--mainly in terms of the child rearing functions.

Sandell's work[53] on Ph.D. scientists employed full time in four consecutive biennial survey years yielded results similar to those of Johnson and Stafford. His regression analysis controlled for type of employment (academic, government or private), field of specialization (natural science, psychology, other), and various measures of professional experience. While he concluded that male academic scientists invest somewhat more in post-school training and receive concomitantly larger salary increases than their female counterparts, he was agnostic about whether the implied lower rate of return to OJT among women resulted from discrimination. Additionally, his calculations implied that sex differences in OJT cannot account for a substantial portion of the sex difference in earnings among academics (i.e., less than 10 percent of the male/female difference in discounted present value of lifetime earnings was explained by post-school investment in human capital). Finally, for the sake of comparability to other studies, Sandell showed net female/male ratios of academic earnings in the neighborhood of .82, irrespective of whether the ratio was computed using annual salary or the discounted present value of lifetime (35 years) earnings.[54]

The study of sex differences in annual earnings by Darland et al.[55] utilized data originally gathered by the Carnegie Commission and the American Council on Education for more than 13,000 faculty members employed in over 300 institutions of higher education. The authors employed an extremely large number of variables in their regression analysis including

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[53] Sandell, "Male-Female Salary Differences."

[54] It should be noted that Sandell's work contains one of the most complete discussions of the empirical methodology problems in analyzing sex differences in earnings.

[55] M. G. Darland, S. A. Dawkins, J. L. Lovasich, E. L. Scott, M. E. Sherman and J. A. Whipple, "Application of Multivariate Regression to Studies of Salary Differences Between Men and Women," mimeo (presented at annual meetings of American Statistical Association, December 1973).

age; marital/family status; type and quality of employing institution; degree level and prestige of degree-granting institution; field of specialization; measures of personal productivity (articles and books published as well as number of sources of research support); proportion of time spent in teaching, administration and research; length of service with current employer; total academic experience; and a number of interaction terms.[56] While the authors found residual (discriminatory) earnings differences in nearly every field and type of institution, they concluded that there was more discrimination in research universities and in the biological/physical sciences. Finally, the results of the study were used to infer that women's earnings grow more slowly than men's do with experience.

In a study of sex differences in the annual earnings of academics within a single (anonymous) university, Katz[57] used regression analysis to adjust an observed female/male (1969) salary ratio from .70 to .85. The procedure used was addition of a dummy variable representing sex to a salary-determination regression equation. Among the other variables included in the analysis were amount and quality of publications; measures of teaching ability; time spent in public service, committee, and administrative activity; quality of institution of undergraduate and graduate degrees; and general field of specialization (social science, physical science, humanities, English). Yet, the author's conclusion that that half of the observed sex disparity in salary was due to discrimination cannot be accepted uncritically. First of all, the proxy variable for experience ignored the sex difference in continuity of employment and, therefore, was less accurate for women than for men. Second, and perhaps more fundamental, the study contained no reference to possible interaction between sex and the other determinants of salary. As research reviewed above has demonstrated, there is reason to believe that the process of salary determination differs between men and women; specifically with respect to the returns to experience.

Gordon et al.[58] also used data on the (full-time) faculty of a single (anonymous) university to investigate sex differences in annual salaries.

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[56] It is not possible to use the numerical results presented by the authors to construct a female/male earnings ratio comparable to those in other studies. Furthermore, the coding of several variables used in the analysis does not lend itself to meaningful interpretation of the estimated regression coefficients--e.g., some dichotomies were coded 1,2 rather than 0,1.

[57] David A. Katz, "Faculty Salaries, Promotions, and Productivity at a Large University," American Economic Review 63 (June 1973):469-477.

[58] Nancy M. Gordon, Thomas E. Morton and Ina C. Braden, "Faculty Salaries: Is There Discrimination by Sex, Race and Discipline?" American Economic Review 64 (June 1974):419-427.

Using several types of regression analyses to control for age, race, years at the university, education, rank and departmental affiliation the authors adjusted the female/male salary ratio from about .73 to about .90. The authors further found that the net differential widened with age and rank; the latter deriving mainly from the smaller salary increment for women than men associated with the promotion from associate to full professor. Although the conclusions are cautiously agnostic about whether the residual sex differential was attributable to discrimination, the authors' analysis led them to reject the hypothesis that this employer used sex as a proxy for career commitment in its hiring and promotion decisions.[59] Finally, although the result may be unreliable because of the small sample size underlying it, the regression coefficients indicate an instance in which the net female/male salary ratio exceeded 1.0--namely in the comparison of black women faculty to their white male counterparts.

Another, more heterogenous, population group that can be identified as a focus of studies of sex differences in earnings is persons in professional, nonacademic occupations. Sandell's study which was reviewed above,[60] contained parallel analyses for Ph.D. scientists employed in academe, the government sector and the private sector. In contrast to his conclusion for academics, Sandell found that greater investment by male scientists in nonacademic jobs as compared to their female counterparts did account for a considerable fraction of the sex difference in earnings. Among the government workers, for example, the ratio increased from about .85 to about .92; although the remaining differential was significant. Using a limited number of control variables and a dummy variable to represent sex in a single regression equation, Melichar[61] also analyzed annual salaries of professionals with National Register data. Controlling for degree level, type of work, age and field of specialization he found a gross salary ratio of .73 and a net ratio of .84 among full-time, civilian professionals in 1966. The comparable figures were .76 and .81 where the focus was narrowed to economists. In view of the simplicity of the statistical procedures used, it is probably well that the author never suggested that the quantitative results were useful estimates of the effect of sex discrimination.

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[59] The evidence which led to the conclusion was that the net sex differential did not decline with increasing length of service in the university.

[60] Sandell, "Male-Female Salary Differences."

[61] See studies II and III in N. Arnold Tolles and Emanuel Melichar," Studies of the Structure of Economists' Salaries and Income," American Economic Review 58 (December 1968-Part 2).

Bosworth[62] used 1970 Census data to calculate a discrimination coefficient (defined as 1 minus the ratio of median female income to median male income) within 72 cells of a professional occupation by professional industry matrix. Comparing the pattern of these coefficients to the pattern of sex composition of employment in the occupation-industry categories he concluded that women fare relatively better in traditionally female jobs. This contrasts rather sharply with the crowding hypothesis discussed above. On the other hand, Bosworth's conclusions are rather impressionistic and were not based on having controlled for experience and education differences between men and women, even within narrowly defined jobs. The study is useful, however, in illustrating the wide range of values of the unadjusted female/male income ratio among professional occupations; from a low of .38 for writers, artists and entertainers to a high of .78 for social and recreation workers. Also, there is considerable variation according to industry within any occupation--e.g., among computer specialists the ratio was .70 for those employed by hospitals whereas it was .96 for those working in (non-teaching) jobs in private educational institutions.

The study of federal white collar workers by Corazzini[63] utilized data from the files of the U.S. Civil Service Commission. Employing regression analysis to hold constant age, education, pre-government-service work experience, supervisory responsibility, marital and family status, receipt of formal post-school training, and occupation group (professional, administrative/technical, other), Corazzini adjusted the annual salary ratio from .69 to .80. While acknowledging that his data provide an inadequate measure of female work experience, he heuristically estimated that better data could further reduce the earnings by only one-third (i.e., raise the ratio to about .86). Similar to other studies, this research found a lower return to female than male experience, but also found higher returns to formal education and post-school training among women than among men. Corazzini also rejected the hypothesis that the earnings gap among federal white collar employees was significantly attributable to sex differences in occupational classification.

In a rare (for economists) case study of 272 professional employees in a single private corporation, Malkiel and Malkiel[64] used regression

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[62]Bruce Bosworth, "An Examination of Male and Female Earnings in Profesional Industry and Occupational Classifications," mimeo (presented at annual meetings of American Statistical Association, December 1973).

[63]Arthur Corazzini, "Equality of Employment Opportunity in the Federal White-Collar Civil Service," Journal of Human Resources 7 (Fall 1972): 424-445.

[64]Malkiel and Malkiel, 'Male-Female Pay Differentials."

analysis to investigate male/female differences in annual earnings. Because the data related to salary determination within a single firm, they permitted the authors to use an accurate measure of job-related labor market experience along with measures of post-high school education, rate of absenteeism, marital status, and personal "productivity" (publications and college field of study). Using these variables the researchers were able to increase the earnings ratio from about .66 to between .75 and .89. (The values of the net ratio vary because of the index number problem alluded to earlier in this review and because there were separate estimates for each of four years during the interval 1966-1971). When the authors added a 13-category index of job level to the regression, the sex difference in earnings virtually disappeared (i.e., the adjusted ratio was .98). The Malkiels concluded that while there was no evidence of discrimination in the form of unequal pay for equal work, the obviously unequal pay and job level for equal characteristics implied that occupational assignment was the form in which sex discrimination was manifested.

The remaining studies which have used occupation groups to define their universes of interest actually are quite variegated but are aggregated here for convenience of exposition. Three of them utilized establishment data collected in Bureau of Labor Statistics Area Wage Surveys. McNulty[65] employed tabular analyses and focused on eight office occupations and three plant jobs.[66] His results indicated considerable, but unsystematic, regional variation in the intra-occupational female/male earnings in 1966 ratio.[67] Furthermore, within each of the occupations considered he demonstrated that the average ratio for firms with sex-integrated work forces was higher than the ratio constructed by dividing the average wage of males in segregated firms into the average wage of women in segregated firms. For example, among payroll clerks the first ratio was .96 and the second was .79. This implies that intra-occupational sex segregation by type of firm is part of the cause of women's lower earnings. On the other hand, McNulty also concluded that these results do not provide evidence of intrafirm discrimination in the form of unequal pay for equal work.

Buckley's analysis[68] of 1971 BLS data concentrated on the same eight office occupations and two of the three plant jobs. While his conclusions

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[65]Donald McNulty, "Differences in Pay Between Men and Women Workers," Monthly Labor Review 90 (December 1967):40-43.

[66]The office occupations were as follows: accounting clerks A and B, order clerk, payroll clerk, office boys and girls, tabulating machine operators A, B and C. The plant jobs were as follows: elevator operator, janitor and shipping packer.

[67]Some earnings were measured in hourly units and others in weekly units.

[68]John E. Buckley, "Pay Differences Between Men and Women in the Same Job," Monthly Labor Review 94 (November 1971):36-39.

regarding sex discrimination in the labor market were more guarded than McNulty's were, the data he presented convey the same impressions. For example, a simple average of the female/male wage ratio across the ten occupations he studied was found to be .85, whereas within integrated firms the comparable figure was .94 and the ratio of the averages for workers in segregated firms was .82. Nonetheless, both authors were wise to restrain their inferences concerning discrimination because their analyses did not contain any measures of the personal characteristics of the incumbents of the several occupations. Furthermore, within several of the occupations as many as one-fourth of the establishments reported an earnings differential in favor of women.[69]

Blau's[70] analysis of (1970) BLS data differed substantially from those by Buckley and McNulty. She studied seven office occupations and five professional/technical occupations,[71] utilized establishments from only three cities (Boston, New York and Philadelphia), focused exclusively on hourly wages, and employed multivariate regression analysis. Nevertheless, she also acknowledged the difficulty in inferring conclusions about discrimination because of the data limitations--e.g., unavailability of information on the personal characteristics of workers. Combining the analyses of the determinants of average female wage rates and the determinants of the sex distribution of employment, the author concluded that women are disproportionately represented in low-wage industries and firms. Further, the findings indicated that within manufacturing, unionization and size of firm were positively related to the firm's average wage and negatively related to the representation of women in its work force. Finally, the author concluded that her results support the hypothesis that intra-occupational sex disparities in earnings are attributable mainly to differences in the distribution of men and women among firms--especially the "exclusionary behavior of high wage firms."[72]

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[69] Of course, even this is not prima facie evidence of nondiscrimination since the differential could have been less than the differential in seniority or other wage-related personal characteristic. This latter situation is one form of what Phyllis Wallace has characterized as the "feminine version of the Ralph Bunche syndrome." See Phyllis Wallace, "Sex Discrimination: Some Societal Constraints on Upward Mobility for Women Executives," in Eli Ginzberg and Alice Yohalem (eds.), Corporate Lib: Women's Challenge to Management (Baltimore: Johns Hopkins University Press, 1973).

[70] Blau, "Pay Differentials."

[71] The office jobs were: accounting clerks A and B, order clerk, office boys and girls, tabulating machine operators A and B. The other occupations were: systems analyst B; computer programmers A,B and C; computer operator B.

[72] Blau, "Pay Differentials," p. 168.

Finally, Hamilton's papers[73] summarizing her dissertation focused on the sex differential in wages within four occupations (i.e., accountants, tabulating machine operators, punch press operators and janitors and janitresses). The analysis was based on establishment survey data from a larger study of the Chicago labor market area. Hamilton regressed wages on a series of individual characteristics and a series of variables characterizing the firm (e.g., industry, size, unionization). The results were not uniform across the occupations in explaining the observed sex differential in earnings. Among accountants the standardization technique raised the ratio from .83 to .89 and the author inferred that all discrimination among accountants occurred within a firm rather than between firms. For the other occupations, the standardization actually lowered the ratio of female to male wages. This led the author to conclude that an important form in which sex discrimination is manifested is hiring women who are more qualified than the men doing the same job at the same wage.[74]

The last three studies to be reviewed here have two features in common that warrant grouping them together and setting them apart from preceding groups of research works. First, although they use national sample data, their analyses focus on particular age cohorts within the population. Second, all of them employ data from the National Longitudinal Surveys (NLS).

In a paper using methods akin to those of Oaxaca and Blinder, Kohen and Roderick[75] drew upon 1968-1969 data for young (18 to 25 years old) nonstudent, full-time wage and salary workers with at least nine years of education to examine race and sex differentials in hourly earnings. Employing a multiple-equation model and a sequential, regression-based decomposition of the wage gap, the authors concluded that more than nine-tenths of the sex difference in earnings was due to discrimination in the labor market, assuming that the latter accounts for all sex segregation in occupational assignment. In reaching this conclusion they controlled for education beyond the ninth grade, measured mental ability, a composite index of parental family socioeconomic status, an index of the quality of secondary schooling, region of residence and potential labor market experience (adjusting the latter for number of children for the females). Beginning with unadjusted wage ratios of .76 and .82 for whites and blacks, respectively, the regression standardization changed these to .78 and .81. Comparing these results to their estimated

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[73] Mary T. Hamilton, "Discrimination in Employment," in Selected Papers from North American Conference on Labor Statistics (Washington: U.S. Department of Labor, 1970) and "Sex and Income Inequality Among the Employed," Annals of the American Academy of Political and Social Science 409 (September 1973):42-52.

[74] See footnote 68 above.

[75] Kohen and Roderick, "Effects of Race and Sex Discrimination."

effects of racial discrimination among youthful workers, the authors further concluded that a young black woman in the labor market is more disadvantaged by her sex than by her race. While the findings are not easily generalizable to the entire labor force, it is well to note that the study focuses on an age group in which sex differences in experience are doubtless least important. The age of the cohort also eliminates some of the wide disparities in earnings produced by the relatively much greater likelihood of males being in the highest paying professional jobs (e.g., physicians).

Three studies have utilized data on so-called prime-age workers (30-44 years of age) to investigate the sex differential in earnings.[76] In the earliest of these, Suter and Miller[77] combined 1967 NLS data on women in this cohort with CPS data on men of this age to analyze the sex disparity in annual wage and salary income. A principal distinguishing feature of this study is its use of a direct (albeit imperfect) measure of women's historical labor market experience (i.e., the proportion of years since leaving school during which the respondent worked full or part time for at least six months) for a national sample.[78] Focusing on persons employed full time (35 or more hours/week) and full year (50-52 weeks) the overall female/male earnings ratio was found to be .58, whereas the ratio was .75 when the female group was limited to those who had worked at least half of each year since leaving school. Using regression analysis which controlled simultaneously for lifetime work experience, occupational status, education and full time-full year status, Suter and Miller increased the gross earnings ratio from .39 to .62. Finally, the authors concluded that they had demonstrated the existence of sex discrimination in the form of unequal pay for jobs of equal status by estimating a smaller regression coefficient for occupational status among women than among men. It must be noted, however, that this is not equivalent to asserting the existence of unequal pay for equal work because the empirical measure of occupation used in this study cannot be claimed to represent functional differences between occupations.[79]

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[76] Unfortunately, many of the quantitative estimates and interpretations thereof in these studies are questionable because of a coding error in the NLS data on the pre-1967 work experience of the women. Work currently under way at the Center for Human Resource Research with the corrected data should provide more reliable estimates (especially of the impact of work experience on the earnings of women) and interpretations.

[77] Larry Suter and Herman P. Miller, "Income Differences Between Men and Women," American Journal of Sociology 78 (January 1973):962-974.

[78] See footnote 76.

[79] The index was designed to measure socioeconomic status of occupations. Detailed information on the construction of the index appears in Otis D. Duncan, "A Socioeconomic Index for All Occupation," in Albert Reiss et al. (eds.), Occupations and Social Status (New York: Free Press, 1961).

Mincer and Polachek[80] combined SEO data on men 30 to 44 years of age with NLS data on women in this age range to estimate a wage ratio of .66 between white married women and men and a ratio of .86 between white single women and married men. Using some two-stage regression analysis along with standardizations, the authors concluded that adjusting only for education and correctly measured labor force experience would increase the ratio to about .80 for married women and to about .90 for single women.[81] Another interpretation of their results led the authors to conclude that 70 percent of the wage gap among married persons would be eliminated when female labor force experience is accurately measured. Still another use of the estimates suggests that controlling only for work experience differences would actually lower the wage ratio (i.e., widen the gap) when comparing white married men and single women. Finally, the authors candidly professed an inability to conclude either (1) that their explanation of the wage gap was independent of discrimination or (2) that the residual (unexplained) wage gap was due solely to discrimination.

In another paper,[82] Polachek reiterated the preceding conclusions and went further to suggest that accounting for factors other than experience would explain additional portions of the male-female earnings gap.[83] Among the factors suggested, but not demonstrated, to be important was that wives and mothers often accept low paying jobs in order to work closer to home and/or in order to work convenient hours. Finally, extrapolating from the differential continuity in labor force participation between women 30-44 years of age and those 40-44, the author projected a long-run narrowing of the observed wage differential between men and women.

Although many of the above-mentioned studies allude to occupational segregation according to sex, there is a very limited body of economic literature dealing with this phenomenon. This probably derives from the

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[80] Mincer and Polachek, "Family Investments."

[81] See footnote 76.

[82] Polachek, "Discontinuous Labor Force Participation."

[83] The author also used some crude calculations based on 1:1000 data from the 1960 Census to conclude that sex differences in occupational distribution were less important than family characteristics in determining the size of the sex differential in wages. Indeed, he asserted that simultaneously assigning the female occupation distribution to males and the male distribution to females would widen the sex disparity in wages. One wonders, however, whether the simultaneous assignment provides a test of anything relevant.

fact that questions of occupational choice and assignment traditionally have been in the domain of other social sciences (e.g., sociology, psychology).[84] In one of the few relevant studies by economists Tsuchigane and Dodge[85] cited several attitude surveys which attest to the existence of male prejudice against women as one source of the sex segregation of occupations. The authors also constructed a crude index of hiring discrimination for college trained persons (i.e., 1 minus the ratio of the percent of those employed in a field who are women to the percent of those trained in the field who are women). This index was shown to exhibit considerable variation across fields of study. For example, the index was higher in history than in mathematics where it was higher than in computer science. However, as the authors acknowledged, the index did not take account of the likely relationship between choice of field of study and expected labor force participation.

In the introductory portion of her study[86] of intra-occupational sex segregation, Blau utilized an index of segregation to characterize recent states of inter-occupational sex segregation in the entire U.S. labor force. Among the conclusions were that the extent of segregation changed very little over the two decades from 1950 to 1970 and that roughly two-thirds of the female labor force would have to change occupations in order to eliminate the existing cases of over- and under-representation. It was also concluded that the stability of the extent of segregation may be explained in terms of the relative decrease in the importance of agricultural work and unskilled labor along with rapid growth of traditionally female jobs relative to growth in the supply of female labor.

In addition to sex segregation by occupation, some theorizing has posited the existence of sex segregation by firm (and industry) as a source of the earnings gap. Once again, there is little literature on the validity[87] or cause of this type of segregation in the labor market. In one of the relevant studies Shepherd and Levin[88] used data on 174

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[84] Probably the most complete taxonomy of reasons for the development and persistence of a sex differential in occupational distribution can be found in Valerie Oppenheimer, "The Sex Labelling of Jobs," Industrial Relations 7 (May 1968):219-234.

[85] Tsuchigane and Dodge, Economic Discrimination.

[86] Blau, "Pay Differentials."

[87] See the references above in Buckley, "Pay Differences"; Hamilton, "Discrimination in Employment"; and McNulty, "Differences in Pay."

[88] William Shepherd and Sharon Levin, "Managerial Discrimination in Large Firms," Review of Economics and Statistics 55 (November 1973): 412-422.

large industrial corporations. They used regression analysis to test hypotheses about the determinants of hiring and promoting women into high-level white collar positions (officials, managers, professionals, and technicians). Most of the hypothesized determinants were characteristics of the firm--e.g., product market share, value of assets, advertising intensity, rate of growth in sales, industry, and percent of the firm's total employment which was female. To control for labor supply conditions the authors modified the sample slightly and added variables characterizing the local labor market--i.e., population size, unemployment rate, and percent of high-level white collar jobs held by women. The most confident conclusions that emerged were that women were disproportionately underrepresented in the upper echelon jobs in these large firms relative to all firms in the economy and that this situation deteriorated between 1966 and 1970. Within the group of large firms women's opportunities for entering managerial jobs were found to be much lower in producer-good firms and higher in the women's-good firms. The results also suggested that as the proportion of women in the firm's work force increased, women as a percent of management declined. Local area supply factors and the measures of a firm's market power were found to be irrelevant.

Although Blau's empirical work also was confined to workers in only a few occupations, her conceptual framework for analyzing intraoccupational, employment and industry segregation was much broader.[89] In developing the framework she drew upon several existing theories about the operation of labor markets including internal labor market analysis, the dual (or segmented) labor market theses, and the overcrowding hypothesis. The framework was extended to yield hypotheses about the relationship between sex segregation by firm (and industry) and sex differentials in pay. Beyond the findings reviewed above,[90] Blau concluded that her empirical evidence demonstrated the existence of intraoccupational segregation and that intraoccupational pay differentials by sex were primarily due to interfirm differences in pay rather than to intrafirm sex differences in pay. Despite the limited number of occupations studied, the author also found a pattern of establishment segregation which held across occupational categories.

Concluding Comments

It is easier to summarize the many studies that have been conducted than to synthesize their findings and to make confident generalizations about the nature, extent and sources of sex differentiation in the labor market. The many differences in data sources, in models, and in methods of analysis make comparisons difficult. To facilitate comparisons the

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[89] Blau, "Pay Differentials."

[90] See p. 71 above.

table which follows this review contains a few salient characteristics of each of the empirical studies of sex differences in earnings.

Despite the diversity in existing research, a number of generalizations appear to be warranted. To begin with, perhaps the sole consistent result of the mélange of empirical studies surveyed is that sex discrimination in the form of unequal pay for equal work is of little, if any, quantitative significance. While there also seems to be consensus that occupational differentiation is an important source of the observed male-female earnings disparity, it is by no means clear to what extent the differentiation is produced by labor market discrimination (e.g., in promotions) or by sex role discrimination in the home and schools. In addition, research on sex segregation by establishment is in its infancy and there are few studies relating to what Phyllis Wallace has referred to as the "feminine version of the Ralph Bunche syndrome,"[91] i.e., that discrimination in the labor market assumes the form of hiring and promoting women with higher qualifications than men doing the same job at the same pay.

Also, there is an evident need for further theoretical work drawing upon the several approaches extant in the literature and utilizing the resources of other social sciences, if we are to understand fully the empirical phenomena. While economists may be capable of explaining the consequences of different types of discriminatory behavior, we are not able to specify the mechanisms by which the attitudes underlying the behavior are manifested. Moreover, our theories provide little insight into the consequences of eliminating alternative forms of discriminatory behavior.

For the purpose of quantifying the extent to which invidious discrimination contributes to observed sex differences in economic rewards, a researcher need only be concerned with earnings, since they are the end product of labor market activity. In this context it is immaterial whether sex discrimination assumes the form of unequal pay for equal work; artificial barriers to entry into higher paying occupations, industries or firms; artificial barriers to the acquisition of formal vocational training; unequal layoff policies; or combinations of these forms. On the other hand, if research is to do more than quantify the impact of sex discrimination, it must be mindful of the variety of forms in which discrimination can be manifested. Indeed, for research to serve as a basis for policy making and government intervention in the labor market, it must attempt to disentangle the determinants of male/female earnings differences and separate those commonly grouped together under the heading of discrimination.

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[91] See footnote 69.

Table

Summary of Research on Sex Differentials in Earnings

Author	Data source(s) and population studied	Measure of earnings	Statistical method and explanatory variables[a,b]	Earnings ratio (F/M)[c]	
				Observed	Adjusted[d]
Sanborn	Census: employed civilian wage and salary workers[b] (W/S)	1949 Annual earnings	R: 1,2,10, 12,18	.58	.88
Fuchs	Census: nonfarm workers	1959 Hourly earnings	R: 1,3,8, 15,19	.60	.66
	Nonfarm pvt. W/S			.58	.64
	Nonfarm govt. W/S			.81	.79
Gwartney and Stroup	Census: U.S. population 25+ years old	Median annual income 1959	F,F: 1,2	.33	.39
		1969	1,2	.32	.40
	Full-time, full-year workers (FTFY) U.S. population	Mean annual income 1969	1,2	.56	.58
		Median annual income 1959			
	Never married		1,2,10	.98	.93
	MSP[c]		1,2,10	.33	.51
Cohen	Survey of Working Conditions: FT, W/S, 22-64 years old	1969 Annual earnings	R,F: 1,2, 10,11, 14,17, 26,27	.55	.71
Sawhill	CPS: W/S	1966 Annual earnings	R: 1-3,10 21	.46	.56
Oaxaca	SEO: urban employees, 16+ years old	1967 Hourly earnings	R,S: 1,3, 7-10,19, 21		
	Whites			.65	.72
	Blacks			.67	.69
	Whites		+13,15-17		.78
	Blacks				.80

(Table continued on next page.)

Table

Continued

Author	Data source(s) and population studied	Measure of earnings	Statistical method and explanatory variables[a,b]	Earnings ratio (F/M)[c]	
				Observed	Adjusted[d]
Bluestone et al.	SEO: W/S, FTFY, whites	1967 Hourly earnings	F: 1,13	.64	.66
Blinder	Survey of Income Dynamics: white employed heads of household, 25+ years old	1969 Hourly earnings	R,S: 2,9, 18,19, 21,22	.56	.56
			R,S: 1,2, 5,9,11, 13,15, 17,19, 21		.63
Bayer and Astin	NSF Register: Science Ph.D.'s in teaching jobs, <7 years experience	1964 Annual salary	F: 6,14,28	.93	.97
Johnson and Stafford	NSF Register: Ph.D.'s in academic jobs	1970 Academic salary	R; 6,22-24		
	No years experience				
	Economics			NA[e]	.95
	Sociology			NA	.96
	Mathematics			NA	.94
	Biology			NA	.89
Sandell	NSF Register: employed Ph.D. scientists	1960 Annual (basic) salary	R,S: 6,23, 28		
	Academic job			.82	.86
	Government job			.85	.91
	Private job			.82	.97
Darland et al.	Carnegie + ACE: college and university faculty	1969 Annual salary	R,S: 1,2, 6,8,10, 11,14, 23-25, 28	NA	NA

(Table continued on next page.)

Table

Continued

Author	Data source(s) and Population studied	Measure of earnings	Statistical method and explanatory variables[a,b]	Earnings ratio (F/M)[c]	
				Observed	Adjusted[d]
Katz	University "X": university faculty in 11 departments	1969-70 Academic salary	R: 1,10,11, 14,23-25	.70	.85
Gordon et al.	University "Y": academic employees	1970 Academic salary	R,S: 1-3, 11,14,23	.73	.90
Melichar	NSF Register: full-time, civilian scientists	1966 Annual salary	R: 1,2,16, 23,28	.75	.85
Bosworth	Census: selected professionals	1969 Median earnings	F: 12,16		
	Accountants			.43	NA
	Engineers			.57	NA
	Physicians, etc.			.47	NA
	Social recreation workers			.78	NA
	Writers, etc.			.38	NA
Corazzini	U.S. Civil Service Commission: federal white collar workers in D.C. area	Annual salary (1960's)	R: 1-3,5, 6,8,14, 25	.69	.80
Malkiel and Malkiel	Corporation "X": professional employees	Annual salary	R,S: 1,8, 11,23, 25,26		
		1966		.66	.85
		1969		.67	.81
		1970		.67	.80
		1971		.65	.81
		1971	R: 1,8,11 14,23,25, 26		.98

(Table continued on next page.)

Table

Continued

Author	Data source(s) and population studied	Measure of earnings	Statistical method and explanatory variables[a,b]	Earnings ratio (F/M)[c]	
				Observed	Adjusted[d]
McNulty	BLS Area Wage Survey: 8 office jobs + 3 plant jobs	1966 Hourly (weekly) earnings	F: 12,16, 21,28		
	Payroll clerks			.79	NA
	Segregated firms			.79	NA
	Integrated firms			.93	NA
	Janitors			.85	NA
	Segregated firms			.73	NA
	Integrated firms			.85	NA
Buckley	BLS Area Wage Survey: 8 office jobs + 2 plant jobs	1970 Hourly (weekly) earnings	F: 12,16, 21,28		
	Payroll clerks			.89	NA
	Segregated firms			.80	NA
	Integrated firms			.89	NA
	Janitors			.87	NA
	Segregated firms			.76	NA
	Integrated firms			.88	NA
Hamilton	Seventy-five firms in Chicago SMSA: 4 occupations	June 1963 hourly wage	R: 1,2,5 7,10,11, 28		
	Janitors			.84	.79
	Punch press operators			.95	.89
Mincer and Polachek	NLS + SEO: married, white W/S, aged 30-44	1967 Hourly earnings	R,S: 1,6, 11	.66	.80
Suter and Miller	NLS and CPS: W/S aged 30-44	1966 Annual earnings	R,S: 1,6, 10,12	.39	.62
Kohen and Roderick	NLS: full-time nonstudent W/S, aged 18-25	1968/69 Hourly earnings	R,S: 1,3,4, 7-9,21, 22,24		
	Whites			.76	.78
	Blacks			.82	.81

(Table continued on next page.)

Table

Continued

a The meaning of the symbols describing the statistical method is as follows: F = frequency distribution or tabular standardization, R = regression analysis, S = separate equation for males and females.

b The explanatory variables associated with the numbers shown are as follows:

1 = Education
2 = Age
3 = Race
4 = Mental ability (intelligence)
5 = Formal training
6 = Actual labor market experience
7 = Proxy for labor market experience
8 = Marital status
9 = Health
10 = Hours of work (annual, weekly, full-time/part-time)
11 = Tenure (length of service with current employer)
12 = Occupation (Census 3-digit)
13 = Occupation (Census 1-digit)
14 = Occupation (system other than 12 or 13)
15 = Class of worker
16 = Industry
17 = Union membership
18 = Urban/rural
19 = Size of city of residence
20 = Length of trip to work
21 = Region of residence
22 = Characteristics of SES background (father's education/occupation, mother's education/occupation, number of siblings, parental family income, migration history, nationality, etc.)
23 = Field of study in college (or field of current specialization)
24 = Quality of schooling (secondary, undergraduate or graduate)
25 = Miscellaneous measures of personal productivity (publication record, peer evaluation, honors or awards)
26 = Absenteeism record
27 = Nonwage fringe benefits of work
28 = Type of employer (government/private, sex segregated or integrated, size of work force).

c The figures shown in these columns occasionally are this reviewer's translation of the author's presentation.

d The figures shown in this column occasionally represent an average of several figures presented by the author.

e NA = not ascertainable.